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Title

MANUFACTURING METHOD FOR HYDROLYSABLE SHEETS

Abstract

[Problems to be Solved]

To improve the wet strength and water-dispersibility of hydrolysable sheets that can be utilized as wet wipes.

[Means for Solution]

Hydrolysable sheets are obtained by sheeting out reaction products prepared by the addition of bases to mixtures of water-dispersible fibers and poorly swellable or water-insoluble carboxymethylcellulose and/or its salts that are 0.30-0.60 in the degree of substitution (D.S.) and pH≥5.0. These hydrolysable

sheets are impregnated with drug solutions for wet wipes depending on necessity.

What is Claimed is:

[Claim 1]

A manufacturing method characterized by sheeting out reaction products prepared by the addition of bases to mixtures of water-dispersible fibers and swellable or water-insoluble carboxymethylcellulose and/or its salts that are 0.30-0.60 in the degree of substitution and pH≥5.0 in a manufacturing method of hydrolysable sheets made from water-dispersible fibers and carboxymethylcellose and/or its salts.

[Claim 2]

A manufacturing method described in Claim 1 in which the said base is sodium carbonate.

[Claim 3]

A manufacturing method described in Claim 1 in which a process to impregnate the said hydrolysable sheets with drug solutions for wet wipes is included.

Detailed Description of the Invention

[0001]

[Industrial Field of Application]

This invention concerns hydrolysable sheet-like materials that are dispersible or soluble in water.

[0002]

[Prior Art]

Conventional wet wipes are well known. Also well known are water-dispersible or water-soluble hydrolysable sheet-like materials represented by wet wipes that can be disposed and flushed away without further treatment by being dispersed or dissolved in water of flushing toilette. The water-dispersibility and the hydrolysability mentioned here are synonymous, and wet wipes possessing such a property are required to have high levels of strength when used wet and quick dispersibility when thrown into ample water. In Japanese Patent Laid-Open No. 01-168999, water-insoluble sodium/calcium salts of carboxymethylcellulose or sodium salt of carboxymethylcellulose is used in order to satisfy both the strength and the dispersibility. In Japanese Patent Publication No. 48-27605, a papermaking method in which alkali metal solutions are sprayed to wet paper made from water-insoluble carboxymethylcellulose is disclosed. In Japanese Patent Laid-Open No. 03-167400, papermaking was done by mixing paper materials with water-insoluble alkali metal salts of carboxymethylcellulose. Also, in Japanese Patent Laid-Open No. 05-25792, aqueous organic solvents containing multi-valent

metal ions are impregnated into paper made from mixtures of paper materials and alkali metal salts of carboxymethylcellulose.

[0003]

[Problems that the Invention is to Solve]

The carboxymethylcellulose and its salts used as a binder in the aforementioned conventional technology change from being water-insoluble to swellable and to water-soluble as the degree of substitution (D.S.) and pH increase. When the carboxymethylcellulose and its salts are used as a binder for papermaking sheets, high swellability of the binder renders homogeneous mixing of the binder and fibers difficult and water-solubility prevents the improvement of sheet strength to a level corresponding to the used amount of the binder because only a small quantity adheres to the produced sheets. Also, high swellability of CMC results in high viscosity of the solution and makes homogeneous spray difficult if a process to spray the binder to the sheets after they are produced is adopted.

[0004]

Therefore, in the manufacturing method for hydrolysable sheets utilizable as wet wipes and the like, the problem to be solved by this invention is to have a required amount of carboxymethylcellulose and/or its salts adhere to the sheets efficiently.

[0005]

[Means for Solving the Problem]

In order to solve the problem, this invention proposes a manufacturing method for hydrolysable sheets made from at least water-dispersible fibers and carboxymethylcellulose and/or its salts.

[0006]

In view of such a background, the feature of this invention is to make sheets by the addition of bases to mixtures of water-dispersible fibers and water-swellable or water-insoluble carboxymethylcellulose and/or its salts that are 0.30-0.60 in the degree of substitution (D.S.) and pH≥5.0. Sodium carbonate is preferred as the aforementioned base.

[0007]

[Examples]

Raw materials used in the manufacturing methods involved in this invention include water-dispersible fibers that can be sheeted with carboxymethylcellulose and/or its salts. Pulp fibers are preferred as the fibers. However, natural fibers such as wool and the like, regenerated fibers such as rayon and the like, semi-synthetic fibers such as acetate and the like, and synthetic fibers such as nylon, polyesters and the like may also be used. Poorly water-swellable or water-insoluble

carboxymethylcellulose and/or its salts that are D.S.=0.30-0.60 and pH≥5.0 are used as a binder to these fibers. Although any kinds of base may be used to render such binders highly water-swellable or water-soluble, sodium carbonate is preferred. Well known papermaking methods, wet or dry manufacturing methods for non-woven fabrics, or manufacturing methods for non-woven fabrics using water jet may be used as a means for sheeting mixtures of these fibers and binders to which a base is added. An explanation of this invention is given in further detail below.

[0008]

Examples 1-5.

A paper material is prepared by solubilizing a suspension of a mixture containing coniferous pulp for papermaking (NBKP), carboxymethylcellulose and/or its salts, and tap water by the addition of a required quantity of sodium carbonate. After letting it stand still, papermaking was carried out with a small experimental papermaking apparatus. The prepared wet paper was dried with a rotating drum dryer at 110°C for 90 seconds to obtain a dry sheet having basic weight of 40 g/m^2. A mixed solution of propylene glycol/calcium chloride/ion-exchanged water=30/0.5/69.5 (in weight ratio) in the quantity of 2.5 times the weight of the sheet was impregnated into the sheet by spraying as a drug solution for wet wipes. A wet wipe was obtained by letting

it stand still at 20°C for 24 hours. The water-dispersibility and wet tensile strength of this wet wipe were evaluated under the conditions described below to confirm the influence of the conditions of the papermaking process on them.

(1) Example 1 and Comparative Example 1

The effect of the added quantity (weight %) of sodium carbonate on the dry weight of carboxymethlcellulose and/or its salts is shown.

(2) Example 2 and Comparative Example 2

The effects of the degree of substitution (D.S.) and pH of carboxymethylcellulose and/or its salts are shown.

(3) Example 3 and Comparative Exmaple 3

The effect of the combined quantities (weight %) of pulp in paper materials and carboxymethylcellulose and/or its salts is given.

(4) Example 4 and Comparative Example 4

The effect of the standing time after the addition of sodium carbonate is shown.

(5) Example 5 and Comparative Example 5

The effect of mixing ratio between the pulp and carboxymethylcellulose and/or its salts is shown.

[0009]

The evaluation of water-dispersibility

A 10cm x 10cm sample of wet wipe was placed in a 300 mL glass

beaker containing 300 mL of ion-exchanged water and stirred with a magnetic stirrer (rotation speed, 600 rpm) to observe the dispersion of the wet wipe over a course of time. The result of the observation was scored in the following manner:

A: The sample was broken to fine pieces within 100 seconds.

B: The sample was broken to fine pieces within 200 seconds.

C: The sample was not broken to fine pieces in 200 seconds.

[0010]

The evaluation of wet tensile strength

A sample, 25 mm width x 150 mm long, of wet wipe was pulled at 100 mm chuck spacing and 100 mm/min pulling velocity to determine the breaking strength. The practical strength of the wet wipe was not insufficient as long as the breaking strength was 300 g or more.

[0011]

The evaluation results of the examples and comparative examples are given in Table 1. These results reveal the following: (1) it is desirable that carboxylmethlcellulose and/or its salts are D.S.=0.30-0.60 and pH≥5.0 (Example 2); (2) it is desirable that the quantity of sodium carbonate is 10-400% in weight to carboxymethlcellulose and/or its salts (Example 1); (3) it is desirabe that the weight ratio of pulp to carboxymethylcellulose and/or its salts is in a range of 98:2 - 55:45; (4) it is desirable

that the concentration of the combined quantity of the pulp and carboxymethylcellulose and/or its salts in the paper materials is 0.5-5% in weight; and (5) it is desirable that the standing time after the addition of sodium carbonate is more than 30 minutes.

[0012]

[Table 1]

Test No.	Pulp/CMC mixing ratio	CMC		Pulp/CMC conc. in paper material (%)	Na_2CO_3 amount (vs CMC weight %)	Paper mateial stand. time (Hr)	Evaluation result		Note
		D.S.	pH				water-dispersi-bility	Tensile strength (g/25mm width)	
Example 1-1	87.5/12.5	0.43	6.1	1	80	2	B	466	
Example 1-2	87.5/12.5	0.43	6.1	1	160	2	A	704	
Example 1-3	87.5/12.5	0.43	6.1	1	400	2	B	737	
Compar. Example 1-1	87.5/12.5	0.43	6.1	1	2	2	C	448	
Compar. Example 1-2	87.5/12.5	0.43	6.1	1	0	2	C	326	
Example 2-1	87.5/12.5	0.58	6.0	1	80	2	A	517	
Compar. Example 2-1	87.5/12.5	0.43	4.7	1	80	2	B	195	
Compar. Example 2-2	87.5/12.5	0.88	6.9	1	80	2	A	263	
Example 3-1	87.5/12.5	0.43	6.1	3	160	2	A	589	
Compar. Example 3-1	87.5/12.5	0.43	6.1	0.04	160	2	A	271	
Compar. Example 3-2	87.5/12.8	0.43	6.1	10	160	2	-	-	Papermaking impossible
Example 4-1	87.5/12.5	0.43	6.1	2	160	1	B	466	
Compar. Example 4-1	87.5/12.5	0.43	6.1	2	160	0.15	C	428	
Example 5-1	95/5	0.43	6.1	2	80	2	A	320	
Compar. Example 5-1	99.5/0.5	0.43	6.1	2	80	2	A	63	
Compar. Example 5-2	50/50	0.43	6.1	2	80	2	-	-	unpeelable from dryer

(note) CMC: carboxymethylcellulose and/or its salts.

[0013]

[Advantages of the Invention]

Because poorly swellable or water-insoluble carboxymethlcellulose and/or its salts are mixed with water-dispersible fibers as a binder, it is easy to make a required amount of a binder adhere to the obtained sheet in the manufacturing method involved in this invention. Such a binder becomes swellable or soluble in water after sheeting water-dispersible fibers by the addition of bases, improves the wet strength of hydrolysable sheets, dissolves when thrown in ample water, and renders the said hydrolysable sheets dispersible.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the sheet-like object of hydration nature which distributes or dissolves to water.
[0002]
[Description of the Prior Art] Conventionally, wet WAIPUSU is common knowledge. Moreover, when it throws underwater [, such as a rinsing toilet,], the sheet-like object of water-dispersion [which distributes or dissolves, passes as it is, and is represented by wet WAIPUSU in which last thing is possible], or hydration nature is also common knowledge. Water-dispersion and hydration nature here are homonymy, and wet WAIPUSU which has such a property is asked for the high intensity when using it by the damp or wet condition, and the prompt dispersibility when investing into a lot of water. In order to reconcile these intensity and dispersibility, in JP,1-168999,A, the sodium / calcium salt of the carboxymethyl cellulose of water-insoluble nature, or the sodium salt of a carboxymethyl cellulose is used. The paper manufacture method which carries out the spray of the alkali-metal solution to the wet paper web which milled paper using the water-insoluble nature carboxymethyl cellulose is indicated by JP,48-27605,B. In JP,3-167400,A, the alkali-metal salt of a water-insoluble nature carboxymethyl cellulose is mixed to a pulp, and paper is milled. Moreover, in JP,5-25792,A, the water organic solvent which contains polyvalent metal ion on the paper which mixed the alkali-metal salt of a carboxymethyl cellulose to the pulp, and milled paper to it is infiltrated.
[0003]
[Problem(s) to be Solved by the Invention] Generally, the degree of substitution (D. S.) and pH follow the carboxymethyl cellulose used as a binder in the aforementioned conventional technology, and its salt on becoming high, they change from water-insoluble nature to bloating tendency, and become still more nearly water-soluble. When using these carboxymethyl celluloses and its salt as a binder and milling a sheet, if the bloating tendency of a binder is high, the uniform mixture with fiber may become difficult, and it may be said that the coating weight to the sheet which milled paper when water-soluble is little, and the intensity of a sheet does not improve, so that the amount of the binder used is balanced. Moreover, at the process which makes a binder adhere to the sheet which milled paper by the spray afterwards, if the bloating tendency of CMC is high, the viscosity of the solution will become high and a uniform spray will become difficult.
[0004] Then, in this invention, it is making to make the carboxymethyl cellulose of requirements, and/or its salt adhere to a sheet efficiently into the technical problem in the manufacture method of a hydration sheet usable as wet WAIPUSU etc.
[0005]
[Means for Solving the Problem] This invention is premised on the manufacture method of the hydration sheet which consists of a carboxymethyl cellulose, and/or its salt and water-dispersion fiber at least in order to solve the aforementioned technical problem.
[0006] In this premise, it is the feature of this invention to add and sheet-ize a base into the mixture of the water bloating tendency which has degree (D. S.) =of substitution0.30-0.60 and pH>=5.0 or a

water-insoluble nature carboxymethyl cellulose, and/or its salt and water-dispersion fiber. As the aforementioned base, a sodium carbonate is used preferably.
[0007]
[Example] The water-dispersion fiber which can be sheet-ized with a carboxymethyl cellulose and/or its salt is contained in the raw material used in the manufacture method concerning this invention. Although it is desirable to use pulp fiber, synthetic fibers, such as semi-synthetic fibers, such as regenerated fibers, such as natural fibers, rayon fiber, etc., such as not only it but linen, wool yarn, etc., and acetate, nylon, and polyester, can also be used for the fiber. The carboxymethyl cellulose of the low water bloating tendency or water-insoluble nature which has D.S.=0.30-0.60 and pH>=5.0, and/or its salt are used as a binder to these fiber. Although what thing is sufficient as the base added in order to change this binder to high water bloating tendency or a water-soluble thing, a sodium carbonate is preferably used for it. It can consider as a means to sheet-ize mixture of the these fiber and the binder which added the base, and well-known paper-making technology, wet or a dry-type nonwoven fabric manufacturing technology, the nonwoven fabric manufacturing technology using a water jet, etc. can be used. It is as follows when this invention is further explained to a detail.
[0008] The addition dissolution of the sodium carbonate of requirements was carried out, and it considered as the pulp at the liquid which mixed an example 1 - the needle-leaf tree pulp (NBKP) for 5 paper manufacture, a carboxymethyl cellulose, and/or its salt to tap water, and was distributed. After putting this, paper was milled with the small test paper-milling machine, and the obtained wet paper web was dried for 90 seconds by 110 degreeC using the rotating-drum type dryer, and the dryness sheet of basis-weight 40 g/m2 was obtained. As a medical fluid for wet WAIPUSU, only the amount of 2.5 times of the weight was infiltrated into this sheet by the spray, the mixed liquor of propylene-glycol / calcium chloride / ion-exchange-water =30/0.5/69.5 (weight ratio) was put by 20 more degreeC for 24 hours, and wet WAIPUSU was obtained. About this wet WAIPUSU, water-dispersion and humid tensile strength by the following conditions were evaluated, and the influence which the terms and conditions in paper-milling process have on them was checked. The relation between a series of examples and the example of comparison is Table 1 and as follows.
(1) The influence of the addition (% of the weight) of a sodium carbonate to the dry weight of example 1 and example of comparison 1 carboxymethyl cellulose and/or its salt is shown.
(2) The influence of example 2 and example of comparison 2 carboxymethyl cellulose and/or the degree of substitution of the salt (D. S.), and pH is shown.
(3) The influence of the total quantity (% of the weight) with an example 3, the pulp in example of comparison 3 pulp, a carboxymethyl cellulose, and/or its salt is shown.
(4) The influence of the settling time after an example 4 and example of comparison 4 sodium-carbonate addition is shown.
(5) The influence of a mixing ratio with example 5 and example of comparison 5 pulp, a carboxymethyl cellulose, and/or its salt is shown.
[0009] The evaluation 10cmx10cm water-dispersion piece of a wet WAIPUSU trial was supplied to 300ml glass beaker into which 300ml of ion exchange water was put, it agitated with the magnetic stirrer (rotational frequency 600rpm), and the distributed state of wet WAIPUSU was observed with time. The observation result was evaluated as follows.
A: The piece of a trial subdivides within 100 seconds.
B: The piece of a trial subdivides within 200 seconds.
C: The piece of a trial does not subdivide within in 200 seconds.
[0010] The breaking strength when pulling the piece of a wet WAIPUSU trial with an evaluation width-of-face [of 25mm] x length [of humid tensile strength] of 150mm by the chuck interval of 100mm and speed-of-testing 100 mm/min was measured. When there was at least 300g of breaking strength, wet WAIPUSU did not have a bird clapper in the shortage of intensity practically.
[0011] The evaluation result of an example and the example of comparison is as in Table 1. For (1)

carboxymethyl cellulose from these results, and/or its salt, it is desirable (example 2) that it is D.S.=0.30-0.60 and pH>=5.0. That it is 10 - 400% of the weight of a carboxymethyl cellulose and/or its salt the amount of a sodium carbonate (2) Preferably (example 1) (3) pulp, a carboxymethyl cellulose, and/or the weight ratio with the salt It is desirable that it is in the range of 98:2-55:45, and, as for the concentration in the pulp which (4) pulp, a carboxymethyl cellulose, and/or its salt occupy, it is desirable that it is 0.5 - 5 % of the weight. Moreover, as for the settling time after adding (5) sodium carbonates, it is desirable that it is 30 minutes or more.

[0012]

[Table 1]

試験No.	パルプ/CMC混合比	CMC		抄紙中のパルプ/CMC濃度(%)	炭酸ナトリウム量(対CMC重量%)	抄料の静置時間(時間)	評価結果		備考
		D.S.	pH				水分散性	引張強度(g/25mm幅)	
実施例1の1	87.5/12.5	0.43	6.1	1	80	2	B	466	
実施例1の2	87.5/12.5	0.43	6.1	1	160	2	A	704	
実施例1の3	87.5/12.5	0.43	6.1	1	400	2	B	737	
比較例1の1	87.5/12.5	0.43	6.1	1	2	2	C	448	
比較例1の2	87.5/12.5	0.43	6.1	1	0	2	C	328	
実施例2の1	87.5/12.5	0.58	6.0	1	80	2	A	517	
比較例2の1	87.5/12.5	0.43	4.7	1	80	2	B	185	
比較例2の2	87.5/12.5	0.88	6.9	1	80	2	A	263	
実施例3の1	87.5/12.5	0.43	6.1	3	160	2	A	589	
比較例3の1	87.5/12.5	0.43	6.1	0.04	160	2	A	271	
比較例3の2	87.5/12.5	0.43	6.1	10	160	2	-	-	抄造不能
実施例4の1	87.5/12.5	0.43	6.1	2	160	1	B	466	
比較例4の1	87.5/12.5	0.43	6.1	2	160	0.15	C	428	
実施例5の1	95/5	0.43	6.1	2	80	2	A	320	
比較例5の1	99.5/0.5	0.43	6.1	2	80	2	A	63	
比較例5の2	50/50	0.43	6.1	2	80	2	-	-	ドライヤーからの剥離不能

(注) CMC：カルボキシメチルセルロースおよび/またはその塩

[0013]

[Effect of the Invention] In the manufacture method of the hydration sheet concerning this invention, since it mixes for water-dispersion fiber by using the carboxymethyl cellulose of low bloating tendency or water-insoluble nature, and/or its salt as a binder, it is easy to make the binder of requirements adhere to the sheet obtained. It becomes water-soluble, after water-dispersion fiber is sheet-ized by addition of a base, this binder dissolves promptly, water bloating tendency or when it raises the wet strength of a hydration sheet and supplies into a lot of water, and it enables distribution of the aforementioned hydration sheet.

[Translation done.]

Citation /

PRODUCTION OF WATER-SOLUBLE SHEET

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Inventor(s): TAKEUCHI NAOTO;; MONOBE MASANORI;; OKUDA TOSHIYUKI;; OKUBO TOSHIYA
Applicant(s): UNI CHARM CORP
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EC Classification:
Equivalents: JP3150586B2

Abstract

PROBLEM TO BE SOLVED: To improve wet strength and dispersibility to water of a water-soluble sheet usable as wet wipes.
SOLUTION: A base is added to a mixture of a low-swelling or water- insoluble carboxymethyl cellulose having 0.30-0.60 degree of substitution(D.S.) and pH >=5.0 an/or its salt with a water-dispersible fiber, and the mixture is formed into sheet to provide the objective water-soluble sheet. As necessary, a chemical for wet wipes is impregnated into the water-soluble sheet.

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(54)【発明の名称】　水解シートの製造方法

(57)【要約】

【課題】　ウエットワイプスとして使用可能な水解シートの湿潤強度と水に対する分散性とを向上させる。

【解決手段】　置換度（Ｄ．Ｓ．）＝０．３０～０．６０およびｐＨ≧５．０を有する低い膨潤性ないし水不溶性カルボキシメチルセルロースおよび／またはその塩と水分散性繊維との混合物に塩基を添加してシート化することにより、水解シートを得る。この水解シートには、必要に応じてウエットワイプス用薬液を含浸させる。

1

【特許請求の範囲】

【請求項１】カルボキシメチルセルロースおよび／またはその塩と水分散性繊維とからなる水解シートの製造方法において、

置換度＝０．３０～０．６０およびｐＨ≧５．０を有する水膨潤性ないし水不溶性カルボキシメチルセルロースおよび／またはその塩と水分散性繊維との混合物に塩基を添加してシート化することを特徴とする前記製造方法。

【請求項２】前記塩基が炭酸ナトリウムである請求項１記載の製造方法。

【請求項３】前記水解シートにウエットワイプス用薬液を含浸させる工程が含まれる請求項１記載の製造方法。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】この発明は、水に対して分散または溶解する水解性のシート状物に関する。

【０００２】

【従来の技術】従来、ウエットワイプスは周知である。また、水洗トイレ等の水中に投ずると分散または溶解してそのまま流し去ることが可能なウエットワイプスに代表される水分散性または水解性のシート状物も周知である。ここでいう水分散性と水解性とは同義であって、そのような性質を有するウエットワイプスには、湿潤状態で使用するときの高い強度と、大量の水の中へ投じたときの速やかな分散性とが求められる。これら強度と分散性とを両立させるために、特開平１－１６８９９９号公報では水不溶性のカルボキシメチルセルロースのナトリウム／カルシウム塩、または、カルボキシメチルセルロースのナトリウム塩を使用している。特公昭４８－２７６０５号公報には、水不溶性カルボキシメチルセルロースを使用して抄造した湿紙にアルカリ金属水溶液をスプレーする製紙方法が開示されている。特開平３－１６７４００号公報では、水不溶性カルボキシメチルセルロースのアルカリ金属塩を紙料に混合して抄造している。また、特開平５－２５７９２号公報では、紙料にカルボキシメチルセルロースのアルカリ金属塩を混合して抄造した紙に多価金属イオンを含有する含水有機溶媒を含浸させている。

【０００３】

【発明が解決しようとする課題】前記従来技術においてバインダーとして使用されるカルボキシメチルセルロースとその塩は、一般に置換度（Ｄ．Ｓ．）、ｐＨが高くなるに伴い水不溶性から膨潤性へと変化し、さらに水溶性となる。これらカルボキシメチルセルロースやその塩をバインダーにしてシートを抄造する場合に、バインダーの膨潤性が高ければ繊維との均一な混合が難しくなり、また水溶性であれば抄造したシートに対する付着量が少量でバインダーの使用量に見合うほどシートの強度が向上しないということがある。また、抄造したシートに後からバインダーをスプレーで付着させる工程では、ＣＭＣの膨潤性が高いと、その水溶液の粘度が高くなり、均一なスプレーが難しくなる。

2

【０００４】そこで、この発明では、ウエットワイプス等として使用可能な水解シートの製造方法において、所要量のカルボキシメチルセルロースおよび／またはその塩を効率よくシートに付着させることを課題にしている。

【０００５】

【課題を解決するための手段】この発明は、前記課題を解決するために、少なくともカルボキシメチルセルロースおよび／またはその塩と水分散性繊維とからなる水解シートの製造方法を前提にしている。

【０００６】かかる前提において、置換度（Ｄ．Ｓ．）＝０．３０～０．６０，ｐＨ≧５．０を有する水膨潤性ないし水不溶性カルボキシメチルセルロースおよび／またはその塩と水分散性繊維との混合物に塩基を添加してシート化することがこの発明の特徴である。前記塩基として、好ましくは炭酸ナトリウムを使用する。

【０００７】

【実施例】この発明に係る製造方法において使用する原料には、カルボキシメチルセルロースおよび／またはその塩とともにシート化することが可能な水分散性繊維が含まれる。その繊維には、パルプ繊維を使用することが好ましいが、それに限らずリネン，ウール等の天然繊維やレーヨン繊維等の再生繊維、アセテート等の半合成繊維、ナイロン，ポリエステル等の合成繊維を使用することもできる。これら繊維に対して、Ｄ．Ｓ．＝０．３０～０．６０，ｐＨ≧５．０を有する低い水膨潤性ないし水不溶性のカルボキシメチルセルロースおよび／またはその塩をバインダーとして使用する。かかるバインダーを高い水膨潤性ないし水溶性のものに変化させるために添加する塩基は、どのようなものでもよいが、好ましくは炭酸ナトリウムを使用する。塩基を添加したこれら繊維とバインダーとの混合物をシート化する手段として、周知の抄紙技術または湿式もしくは乾式の不織布製造技術、ウォータージェットを利用する不織布製造技術等を利用することができる。この発明をさらに詳細に説明すると、以下のとおりである。

【０００８】実施例１～５

製紙用針葉樹パルプ（ＮＢＫＰ）とカルボキシメチルセルロースおよび／またはその塩とを水道水に混合、分散した液に所要量の炭酸ナトリウムを添加溶解して紙料とした。これを静置した後に小型試験抄造機で抄造し、得られた湿紙を回転ドラム型乾燥機を使用して１１０°Ｃで９０秒間乾燥し、坪量４０ｇ／ｍ²の乾燥シートを得た。ウエットワイプス用薬液としてプロピレングリコール／塩化カルシウム／イオン交換水＝３０／０．５／６９．５（重量比）の混合液を、このシートにその重量の２．５倍量だけスプレーで含浸させ、さらに２０°Ｃで

3

２４時間静置して、ウエットワイプスを得た。このウエットワイプスについて、下記条件による水分散性と湿潤引張強度とを評価し、抄造過程での諸条件がそれらに与える影響を確認した。一連の実施例と比較例との関係は、表１および下記のとおりである。

（１）実施例１と比較例１

カルボキシメチルセルロースおよび／またはその塩の乾燥重量に対する炭酸ナトリウムの添加量（重量%）の影響を示す。

（２）実施例２と比較例２

カルボキシメチルセルロースおよび／またはその塩の置換度（Ｄ．Ｓ．）とｐＨの影響を示す。

（３）実施例３と比較例３

紙料中のパルプとカルボキシメチルセルロースおよび／またはその塩との合計量（重量%）の影響を示す。

（４）実施例４と比較例４

炭酸ナトリウム添加後の静置時間の影響を示す。

（５）実施例５と比較例５

パルプとカルボキシメチルセルロースおよび／またはその塩との混合比の影響を示す。

【０００９】水分散性の評価

１０ｃｍ×１０ｃｍのウエットワイプス試片を、イオン交換水３００ｍｌを入れた３００ｍｌガラスビーカーに投入してマグネチックスタラーで撹拌（回転数６００ｒｐｍ）し、ウエットワイプスの分散状態を経時的に観察した。観察結果は次のように評価した。

4

＊Ａ：　試片が１００秒以内に細分化する。

Ｂ：　試片が２００秒以内に細分化する。

Ｃ：　試片が２００秒以内では細分化しない。

【００１０】湿潤引張強度の評価

幅２５ｍｍ×長さ１５０ｍｍのウエットワイプス試片をチャック間隔１００ｍｍ、引張速度１００ｍｍ／ｍｉｎで引っ張ったときの破断強度を測定した。破断強度が少なくとも３００ｇあれば、ウエットワイプスは実用上強度不足になることがなかった。

【００１１】実施例と比較例の評価結果は、表１のとおりである。これらの結果から、（１）カルボキシメチルセルロースおよび／またはその塩はＤ．Ｓ．＝０．３０～０．６０，ｐＨ≧５．０であることが好ましく（実施例２）、（２）炭酸ナトリウムの量は、カルボキシメチルセルロースおよび／またはその塩の重量の１０～４００%であることが好ましく（実施例１）、（３）パルプとカルボキシメチルセルロースおよび／またはその塩との重量比は、９８：２～５５：４５の範囲にあることが好ましく、（４）パルプとカルボキシメチルセルロースおよび／またはその塩とが占める紙料中の濃度は０．５～５重量%であることが好ましく、また、（５）炭酸ナトリウムを添加後の静置時間は３０分以上であることが好ましい。

【００１２】

【表１】

試験No.	パルプ／CMC混合比	CMC		紙料中のパルプ／CMC濃度(%)	炭酸ナトリウム量（対CMC重量%）	紙料の静置時間（時間）	評価結果		備考
		D.S.	pH				水分散性	引張強度（g／25mm幅）	
実施例1の1	87.5／12.5	0.43	6.1	1	80	2	B	466	
実施例1の2	87.5／12.5	0.43	6.1	1	160	2	A	704	
実施例1の3	87.5／12.5	0.43	6.1	1	400	2	B	737	
比較例1の1	87.5／12.5	0.43	6.1	1	2	2	C	448	
比較例1の2	87.5／12.5	0.43	6.1	1	0	2	C	326	
実施例2の1	87.5／12.5	0.58	6.0	1	80	2	A	517	
比較例2の1	87.5／12.5	0.43	4.7	1	80	2	B	195	
比較例2の2	87.5／12.5	0.86	6.9	1	80	2	A	253	
実施例3の1	87.5／12.5	0.43	6.1	3	160	2	A	589	
比較例3の1	87.5／12.5	0.43	6.1	0.04	160	2	A	271	
比較例3の2	87.5／12.5	0.43	6.1	10	160	2	－	－	抄造不能
実施例4の1	87.5／12.5	0.43	6.1	2	160	1	B	466	
比較例4の1	87.5／12.5	0.43	6.1	2	160	0.15	C	428	
実施例5の1	95／5	0.43	6.1	2	80	2	A	320	
比較例5の1	99.5／0.5	0.43	6.1	2	80	2	A	63	
比較例5の2	50／50	0.43	6.1	2	80	2	－	－	ドライヤーからの剥離不能

（注）CMC：カルボキシメチルセルロースおよび／またはその塩

【００１３】　【発明の効果】この発明に係る水解シートの製造方法に

5

おいては、低い膨潤性または水不溶性のカルボキシメチルセルロースおよび／またはその塩をバインダーとして水分散性繊維に混合するから、得られるシートに所要量のバインダーを付着させることが容易である。かかるバインダーは、塩基の添加によって水分散性繊維がシート

6

化された後に水膨潤性ないし水溶性となり、水解シートの湿潤強度を向上させ、かつ、大量の水の中へ投入したときには速やかに溶解し、前記水解シートの分散を可能にする。